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PALÆOZOIC STRATIGRAPHY.

Traité de Géologie. Vol. ii. Les Périodes géologiques. Fasc. i. By Prof. Emile Haug. Pp. 539–928. (Paris: A. Colin, 1908.) Price 9 francs.

THE first volume of Prof. Haug's treatise on geology was noticed in NATURE last year (vol. lxxviii., p. 123), and we now welcome the first part of the second volume, as it is as suggestive, and will no doubt be as useful, as its predecessor. The first volume deals with historical geology, and its first part describes the geological systems—of which the time equivalents are technically valued as periods—from the beginning of the geological record until the end of the Trias. The book continues Prof. Haug's valuable summaries of recent work, his judicious selection of new significant facts and figures, and it is rich in well-reproduced illustrations. It has the merit of being a very cheap text-book, as, though it includes 392 closely printed pages and twenty-eight excellent plates illustrating rocks, fossils and scenery, its published price is only 9 francs. A feature in the first volume that we remarked with regret was the scanty reference to British work; this volume is a great improvement in that respect, as British geology receives its fair share of attention, though the author must have missed several important recent memoirs or he would not have remarked that Carboniferous palæontology has been for a long time past neglected in this country or inserted the footnote on p. 763. The author does not always select for reference the most valued British results, for he quotes Monian and Arvonian, and omits some later more useful terms.

The Palæozoic he divides into four systems—Cambrian, Silurian, Devonian, and Anthracolitic. He subdivides the Silurian into two subperiods, the Ordovician and Gothlandian, and as he admits that they are independent, both stratigraphically and palæontologically, it may be regretted that he does not accept them as distinct systems; for if the name Gothlandian continues to increase in favour, there is a danger that when the two divisions are accepted as separate systems, the term Silurian will fall altogether into disuse. The Devonian system the author adopts mainly on stratigraphical grounds, as he remarks that the fauna alone is insufficient to justify the distinction, as it is so poor in families special to the period.

The volume begins with an introduction to the principles of stratigraphy, and then describes the geological periods in turn. Prof. Haug explains the gradual recognition of the scientific basis and world-wide value of the divisions between the geological systems, for they are due to movements which affected the world as a whole, and by modifying geography and climate produced simultaneous changes in the contemporary faunas and floras. In his account of each system he begins with the history of its classification and nomenclature; he then gives a list of characteristic genera and some notes on the life of the period, illustrated by numerous well-selected figures, such as Ruedemann's Siphonophora-like colony of graptolites with its float. Then follows a brief summary of the distribution of the system through the world, with especial reference to the types of sediments and the relation of the rocks to the transgressions and retreats of the sea. Finally, he gives a sketch of the climate, zoological provinces, and distribution of ocean and continent in the period.

Prof. Haug divides pre-Cambrian time into only two periods, the Archæan and Algonkian. The term Archæan he uses in the sense defined by its founder Dana; he does not go with those—an increasing number—who subdivide the Archæan into two groups, a lower for the massive basal rocks and an upper for the pre-Algonkian schists. The Algonkian he accepts for the comparatively unaltered pre-Cambrian sediments, such as our Torridon sandstone.

One unorthodox feature in the author's classification is his acceptance of one system, for which he adopts Waagen's name Anthracolitic, to include both the Carboniferous and Permian. The suggestion to unite them has been so often made that it is clear that the evidence on its behalf is weighty. It is true that the invertebrate fauna of the Permian is not by itself sufficient to characterise a special geological system, but the great geographical changes and the important development of the vertebrates are strong arguments in favour of maintaining the Permian as a system. The author practically describes the Carboniferous and Permian apart, and together they would make a system inconveniently large and varied.

In the names of the series into which the systems are divided Prof. Haug attaches great weight to priority; thus he rejects the Mississippian of Prof. H. S. Williams because the name had been employed before in a different sense by Marcou, and he appears to regret that he cannot adopt Missourian, instead of the less convenient Uralian, on the ground that the latter is a year older. But as the author rejects Bernician, owing to its having been less adequately defined than the later term Dinantian of de Lapparent, he fortunately allows some discretion in the selection of names. He, however, appears disposed, as a stratigrapher, to pick up the heavy burden of priority which palæontologists are now preparing to throw off.

The account of each geological system concludes with a sketch of its climate, biological provinces, and geography, and the author's work shows the rapid growth in our knowledge of these interesting sections of the earth's history. He directs attention to the numerous Palæozoic glaciations, now proved, including the Huronian described by Coleman at Cobalt, in Canada, the Cambrian discovered by Howchin in South Australia and by Bailey Willis in central China, the Devonian found at Cape Town by Rogers, and the long-known Upper Palæozoic glacials of India, South Africa, and Australia. He rejects the explanation of the last as due to the shift of the South Pole into the Indian Ocean, and attributes the glaciations that occurred in at least four areas of Gondwanaland to geographical causes. He notices the indications of various Palæozoic deserts, but does not mention the desert theory in

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connection with the origin of the Old Red Sandstone, which he attributes to formation in a lagoon or in a sea like the Baltic, which had some slight connection with the open ocean. His maps of the distribution of land and water in successive systems are excellent diagrammatic sketches, and those of Europe give the chief facts of its complex history. Prof. Haug is an expert on the geological history of France, and he clearly explains the many important differences between the Armorican region and the Central Plateau; he shows these two areas by different hachures in three out of his four structural maps of Europe, and it is only in that of the Gothlandian (Silurian) that the two regions are shown as sharing the same geological conditions. J. W. G.

SYSTEMATIC BOTANY.

(1) *Illustrations of Cyperaceae.* Prepared under the direction of the late Charles Baron Clarke, F.R.S. 144 plates, with explanation. (London: Williams and Norgate, 1909.) Price 12*s.* 6*d.* net.

(2) *Das Pflanzenreich. Regni Vegetabilis Conspectus.* Edited by A. Engler. 38 Heft, iv, 20. *Cyperaceae-Caricoideae.* By Georg Kükenthal. Pp. 824. (Leipzig: W. Engelmann, 1909.) Price 41.20 marks.

(3) *Das Pflanzenreich. Regni Vegetabilis Conspectus.* Edited by A. Engler. 39 Heft, iv, 83. *Phytolaccaceae.* By Hans Walter. Pp. 154. (Leipzig: W. Engelmann, 1909.) Price 7.80 marks.

(1) "WE hope, Mr Clarke, that you will live a very long time!" Mr. C. B. Clarke was fond of quoting this remark make to him by a well-known botanist, Mr. Henri Baillon, if we remember aright, who appreciated his careful work on the Cyperaceæ, a difficult family of plants, and one of which a good monograph was much needed. Unfortunately, Mr. Clarke did not live to complete the monograph to which he devoted so much time during the last twenty-five years of his life, and in connection with the preparation of which he had visited, or received plants from, most of the important botanical collections. The work was left in manuscript which proved too extensive for immediate publication, and botanists must for the present be satisfied with excerpts of the descriptions of new genera and species, together with a skeleton of the author's arrangement, which have been published in the Kew Bulletin (Additional Series, viii.). For particulars of synonymy and details of geographical distribution, reference must be made to the manuscript which is preserved at Kew. It is to be regretted that it was found impracticable to render accessible by means of publication the full results of the work of so close and careful a student of so difficult a family. It is true, as Mr. Clarke himself was wont to observe when reproached with delay, that much of the work had already been published in the important floras of various parts of the world in connection with which he was invariably laid under contribution for the elaboration of the Cyperaceæ; such, for example, as the "Flora of British India," the "Flora of Tropical Africa," and others; but the *magnum opus* which should correlate the parts and supply a complete account of the family is wanting.

The volume now under review comprises a series of 144 plates prepared by Mr. Clarke to illustrate the monograph, many years ago, when the plan of arrangement had been determined, as well as the representative and typical species of each genus. They have been drawn by various artists—Mr. N. E. Brown, Mr. Charles Fitch, and Miss M. Smith; most have been reproduced by the collotype process, but some by lithography. They are remarkably clear. A characteristic feature is the representation on a large scale of dissections of the spikelets and flowers, with diagrams illustrating arrangement of parts, and enlargements of the fruit—an important diagnostic character in the Cyperaceæ. Facing each plate is an explanatory page of text indicating in many cases the actual specimen from which the drawings were made, such as R. Brown, n. 6020; Burchell, n. 7892. The whole forms an invaluable series of detailed drawings illustrating the floral morphology of the genera and species of Cyperaceæ. Dr. B. D. Jackson, who is responsible for the production of the volume, refers in his preface to the generosity of Miss Clarke, the sister of the author, to which the issue of the plates is due.

(2) Georg Kükenthal has the reputation of a careful worker on the section of Cyperaceæ, a systematic account of which is embodied in this ponderous Heft of the *Pflanzenreich*—the most substantial from the point of view of size that has yet appeared. In the general account which precedes the special descriptive portion, the author refers to the division of the order into subfamilies based on the presumed cymose character of the spike in many of the genera; two subfamilies were at first recognised—Scirpoideæ, with racemose spikelets, and Caricoideæ, in which the spikelets were of a cymose nature. Subsequently, however, the author was led to restrict the Caricoideæ to Carex and a few allied genera, and it is in this restricted sense that the term is employed in the present monograph. As thus limited, the subfamily contains four genera—Schœnoxiphium, a small South African genus of six species, one of which is also represented on the highlands of east tropical Africa; Cobresia, for which the author prefers the more correct to the more familiar spelling, Kobresia (the genus was named by Willdenow in honour of Paul de Cobres); Uncinia, and the huge genus Carex. The author follows Mr. Clarke in including Elyna and Hemicarex in Cobresia, and arranges the twenty-eight species in the four sections suggested by Mr. Clarke. The chief interest of the book, however, is naturally centred in the exhaustive systematic revision of Carex, of which just upon 800 species are recognised. A true estimate of the value of Kükenthal's work on this genus can only be ascertained by experience in its use in the field and in the herbarium; but it is at any rate a great thing to have a carefully elaborated monograph with full specific descriptions and detailed accounts of synonymy and geographical distribution. We have long waited for a successor to Boeckeler's monograph for purposes of arrangement of the species.

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